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IS 12631 (1989): Pyrotechnics - Fireworks pencils [CHD 26: Explosives and Pyrotechnics]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
**PYROTECHNICS – FIREWORKS PENCILS —
SPECIFICATION**

**भारतीय मानक
प्रातिशब्दी रंग मसाला — विशिष्ट**

UDC 662.113

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NEW DELHI 110002

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Price Group 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 10 March 1989, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

The firework pencils are used solely for the purpose of entertainment. They are also called as '*Bengal illumination*', '*lances*', and '*RANG MASALA*', in Hindi. They derive their name 'Pencil' for their similarity in appearance to the common writing pencil. The production of this product in India is confined to the small scale and cottage industries.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 AUGUST 1996
TO
IS 12631 : 1989 PYROTECHNICS — FIREWORKS
PENCILS — SPECIFICATION

(Page 1, clause 3.1, last sentence) — Delete.

[Page 1, clause 4.1(b)] — Substitute the following for the existing:

'b) Coloured, which produce coloured flame and white stream of sparks, for example, red, green, etc.'

(Page 1, clause 5) — Substitute '**SIZES**' for '**GRADES**'

(Page 1, clause 5.1, line 1) — Substitute 'sizes' for 'grades'.

(Page 2, clause 6.3.5, table, col 5) — Substitute the following for the existing text:

*'Mass of Chemical
Composition*

Min, g

2.5

8.5

9.5

13.0

30.0

24.0

24.0'

(Page 2, clause 6.4, Composition) — Substitute the following for the existing text:

'The construction, composition and mass of chemical composition of pyrotechnic charge shall be as approved by the Chief Controller of Explosives. However, depending upon the variety intended for, pyrotechnic composition may contain one or more of the following materials:

Amend No. 1 to IS 12631:1989

- a) Barium nitrate (*see* IS 4396 : 1981);
- b) Strontium nitrate (*see* IS 5671 : 1984);
- c) Aluminium powder (coarse and medium grades) (*see* IS 438 : 1972);
- d) Aluminium, aluminium-magnesium alloy particulates;
- e) Titanium clips;
- f) Sulphur; and
- g) Poly vinyl chloride.'

[*Page 2, clause 7.2(a) and (b)*]:

Insert 'type and size' between the words 'Name' and 'of'.

Substitute 'Indication of the source of manufacture' for the existing.

(*Page 4, Annex E*) — Substitute the following for the existing text:

'E-1 GENERAL

E-1.1 The test is carried out by placing the fireworks pencils in an oven maintained at 100°C and examining them after 2 h for ignition.

E-2 APPARATUS

E-2.1 Air Oven

It shall be fitted with a thermometer graduated up to 150°C, and shall not have an exposed heating coil.

E-3 PROCEDURE

E-3.1 Take six pieces of fireworks pencils and place them on watch glasses inside an air oven. Close the door of the oven and raise the temperature to 100°C. Maintain the assembly under this condition for 2 h.

E-3.2 The samples shall be taken to have passed the test if the fireworks pencils do not ignite during the test.'

(CHD 026)

Reprography Unit, BIS, New Delhi, India

Indian Standard

PYROTECHNICS — FIREWORKS PENCILS — SPECIFICATION

1 SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for fireworks pencils.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
IS 438 : 1972	Specification for aluminium powder for explosives and pyrotechnic compositions (<i>first revision</i>)
IS 1070 : 1977	Specification for water for general laboratory use (<i>second revision</i>)
IS 4396 : 1981	Specification for barium nitrate for explosives and pyrotechnic compositions (<i>first revision</i>)
IS 4905 : 1968	Methods for random sampling
IS 5671 : 1984	Specification for strontium nitrate for pyrotechnic compositions (<i>first revision</i>)

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definition shall apply.

3.1 Fireworks 'Pencil'

Fireworks pencil is a domestic pyrotechnic item used solely for the purpose of strictly outdoor entertainment. It consists of a long hollow cylindrical paper tube containing a charge of densely packed, non-flashing, non-exploding pyrotechnic composition. This operates safely on the principle of controlled burning of pyrotechnic composition and emission of showers of sparks. When ignited by lighting the tip, burning is usually accompanied by a stream of sparks, twinkles and colour. The construction, composition and the mass of the charge should be as approved by the Chief Controller of Explosives.

4 TYPES

4.1 The fireworks pencils shall be of the following types:

- a) White, which produces white stream of sparks; and

- b) Coloured, which produces coloured (red, green, etc) stream of sparks.

5 GRADES

5.1 The fireworks pencil shall be of six grades according to the nominal length and mass of the pyrotechnic mixture (*see 6.3.5*).

6 REQUIREMENTS

6.1 Charging

The lower portion of the fireworks pencil used for holding the pencil, shall be densely filled with a noncombustible mixture of fine sand and fine ash and sealed by a mixture of sand, saw dust and gum at the end. The upper portion of the fireworks pencils shall be filled with pyrotechnic charge.

6.2 Particle Size

The particles of the pyrotechnic composition shall have diameter or largest diagonal not exceeding 25 percent of the inner diameter of the tube.

6.3 Finishing

6.3.1 The lighting end shall be provided, for easy ignitability, with an igniting tip of composition containing barium nitrate, potassium nitrate, fine aluminium powder, sulphur and dextrin. The length of this igniting composition shall be a minimum of 5 mm.

6.3.1.1 Alternatively, the igniting tip can also be primed with gun powder composition covered with blue touch paper soaked in dilute potassium nitrate solution and twisted at the end.

6.3.2 In case the finishing of the fireworks pencil is as specified in **6.3.1**, the lighting end shall be conspicuously indicated by pasting with a red-tissue paper and non-combustible portion shall be clearly indicated by suitable means.

6.3.3 The charge shall be densely filled, free of gaps and rarefactions. No portion of the item shall deform when pressed between thumb and forefinger.

6.3.4 The pyrotechnic composition or the non-combustible composition at the holding end, shall not leak or spill through the respective end seals or any other part of the item when tapped lightly (*see Annex A*).

6.3.5 Length, Mass and Time of Burning

The total length and diameter of tube, length of free end mass of the pyrotechnic material and duration of effective burning of fireworks

pencil shall be as follows:

Grade	Total Length of Tube cm	Diameter of Tube cm	Length of Free End cm	Mass of Chemical Composition g	Duration of Burning s
1	16.5 ± 0.5	0.65 ± 0.01	7.5 ± 0.5	2.5 ± 0.2	25 ± 5
2	20.0 ± 0.5	0.90 ± 0.05	9.5 ± 0.5	8.5 ± 0.5	45 ± 5
3	30.0 ± 0.5	0.90 ± 0.05	12.0 ± 0.5	9.5 ± 0.5	55 ± 5
4	44.0 ± 0.5	0.90 ± 0.05	22.0 ± 0.5	13.0 ± 0.5	65 ± 5
5	36.5 ± 0.5	1.50 ± 0.05	15.0 ± 0.5	30.0 ± 0.5	76 ± 5
6	38.0 ± 0.5	1.50 ± 0.05	23.0 ± 0.5	24.0 ± 0.5	190 ± 12 (Red)
7	38.0 ± 0.5	1.50 ± 0.05	23.0 ± 0.5	24.0 ± 0.5	150 ± 10 (Green)

6.4 Composition

Depending upon the variety intended for, the pyrotechnic composition may contain some or all of the following materials:

6.4.1 Barium Nitrate, (see IS 4396 : 1981).

6.4.2 Strontium Nitrate, (see IS 5671 : 1984).

6.4.3 Aluminium Powder (Coarse and Medium Grades) (see IS 438 : 1972).

6.4.4 Aluminium, Magnesium-Aluminium Alloy Particulates.

6.4.5 Titanium Chips

6.5 The pyrotechnic composition for fireworks pencil shall be free from chlorate when tested by the method prescribed in Annex B.

6.6 Performance Requirement

6.6.1 Ignitability

The item shall get ignited with relative ease on a small open flame (see Annex C).

6.6.2 The item shall not burst at any stage.

6.6.3 The item shall burn to the full composition-length at a regular speed. The burning shall not be violent, or with jerks and spurts.

6.6.4 The item, while burning, shall not shoot cut particles or burning cinders.

6.6.5 No particle shall be thrown towards the holder of the burning pencil (see Annex D).

6.6.6 The pyrotechnic composition of fireworks pencil shall pass the stability test at 100 ± 2°C for 2 h when tested by method given in Annex E.

7 PACKING AND MARKING

7.1 Packing

The fireworks pencils shall be packed in tens in suitable cardboard boxes. Ten such boxes shall be packed in a packet.

7.2 Marking

Each box and packet shall be legibly and indelibly marked with the following information:

- Name of the material;
- Name of the manufacturer and/or his recognized trade-mark, if any;
- Batch number in code or otherwise to enable the lot of manufacture to be traced from records; and
- Date of manufacture.

7.2.1 In addition to the above, the following cautionary note shall also appear on the label:

WARNING : READ FOLLOWING INSTRUCTIONS BEFORE USE: EMITS SHOWERS OF SPARKS. USE OUT-DOOR ONLY, UNDER CLOSE ADULT SUPERVISION. DO NOT USE BARE FOOTED. LIGHT RED END WITH CANDLE FLAME. HOLD HORIZONTALLY WITH ARM EXTENDED. DO NOT THROW OR POINT BURNING PENCIL AT OTHERS. DISPOSE BURNT OUT PENCILS IN WATER.

8 TEST METHOD

8.1 Tests for the requirements laid down in **6.3.4**, **6.5**, **6.6.1**, **6.6.5** and **6.6.6** shall be carried out as prescribed in Annex A to E of this standard.

8.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (see IS 1070 : 1977) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

9 SAMPLING

9.1 Representative samples of the material shall be drawn and conformity of the material to the requirements of the specification shall be determined according to the procedure prescribed in Annex F.

ANNEX A
(*Clauses 6.3.4 and 8.1*)
TESTS FOR SPILL PROOFNESS

A-1 PROCEDURE

A-1.1 Place a white paper over a rubber mat.

Hold the pencil with the lighting end (red end) downwards. Gently tap the pencil on the paper. Observe any leakage or spillage.

ANNEX B
(*Clauses 6.5 and 8.1*)
DETERMINATION OF CHLORATE

B-1 REAGENT**B-1.1 Aniline Hydrochloride**

Dissolve 18 g of redistilled aniline in 375 ml of concentrated hydrochloric acid and make up the volume to 500 ml with water. Add 2 drops of saturated potassium chlorate solution, shake and allow to stand overnight. Filter off the blue sediment, store the reagent in a glass stoppered bottle in dark.

B-2 PROCEDURE

B-2.1 Take 50 g of the pyrotechnic composition in a 250-ml beaker. Add 50 ml of water and stir well. Digest for 2 minutes by slight warming. Allow it to cool and then filter. To the filtrate, add 50 ml of aniline hydrochloride reagent.

B-2.2 No blue colour shall develop when kept for 10 minutes.

ANNEX C
(*Clauses 6.6.1 and 8.1*)
TEST FOR DAMP PROOFNESS

C-1 PROCEDURE

C-1.1 Take six pieces of fireworks pencils and expose to an atmosphere of 90 percent relative humidity at $27 \pm 2^\circ\text{C}$ (see **C-1.1.1**) for 24h. Examine the fireworks pencils after this period. The material shall be considered to have passed the requirements of the test if on ignition:

- a) The fireworks pencil burns continuously with the emission of continuous sparks and light, and

- b) No hot ash falls out of burning fireworks pencil.

C-1.1.1 The test atmosphere of 90 percent relative humidity at $27 \pm 2^\circ\text{C}$ may be obtained as follows:

Place in a desiccator an aqueous sludge of hydrated zinc sulphate so that the area of surface of the sludge is not less than 75 percent of the floor of the desiccator. The inner plate shall have sufficient perforations so as to diffuse water vapour freely within the desiccator.

ANNEX D
(*Clauses 6.6.5 and 8.1*)
TEST FOR SAFETY IN HANDLING

D-1 APPARATUS

D-1.1 Take a wooden board (30 cm $\times$ 15 cm) and cut a circular groove in its centre all through its length. Paste a white paper (30 cm $\times$ 15 cm) correctly all over the board, on the grooved side. Take another wooden board (15 cm $\times$ 15 cm). Paste a white paper on its one side. Place this board on right angles on the first board at a distance of 5 cm from one end. Place the entire apparatus on a table.

D-2 PROCEDURE

D-2.1 Insert one-third length of the fireworks pencil into the groove, keeping the red end outside. Use a rubber-band to hold it firmly. Light the red end with a candle and observe the white paper pasted on the boards after completion of the burning.

D-2.2 The white paper shall not get charred at any part of it. A sample shall be considered to have passed the test only if all the pencils of the sample leave no charring mark on pasted paper.

ANNEX E

(Clauses 6.6.6 and 8.1)

TEST FOR STABILITY

E-1 PROCEDURE

E-1.1 Take 5 g of the pyrotechnic mixture in a dish and heat slowly on a sand bath to $100 \pm 2^\circ\text{C}$ and keep it at this temperature for two hours. If it is now moistened with water and again dried, it shall not ignite spontaneously.

ANNEX F

(Clause 9.1)

SAMPLING OF FIREWORKS PENCILS

F-1 SCALE OF SAMPLING

F-1.1 Lot

All the boxes of fireworks pencils of the same grade and belonging to the same batch of manufacture shall constitute a lot.

F-1.2 For ascertaining the conformity of the material to the requirements of the specification, samples shall be tested from each lot separately.

F-1.3 The number of boxes to be selected from a lot shall depend on the size of the lot and shall be according to Table 1.

F-1.3.1 The packets from the lot and boxes from the packets shall be selected at random. In order to ensure the randomness of selection, procedures given in IS 4905 : 1968 may be followed.

F-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

F-2.1 From the number of boxes selected according to col 3 of Table 1, the number of boxes given in col 4 of Table 1 shall be randomly chosen. From these boxes, six pieces of fireworks pencils shall be randomly selected so that each box is represented and subjected to the test for damp proofness given in 6.1.1.

F-2.1.1 The lot shall be considered to have satisfied the requirements of damp proofness if all the fireworks pencils in the sample satisfy the corresponding requirement.

F-2.2 The lot having been found satisfactory according to F-2.1 shall be further tested for the requirements given in 6.1, 6.2 and 6.3 of the specification. For this purpose, the number of boxes given in col 5 of Table 1 shall be used. These shall be the boxes remaining out of the boxes selected according to col 3 of Table 1 (after taking the number of boxes required for damp proofness according to F-2.1). From each of the boxes so selected, approximately equal number of fireworks pencils shall be selected so as to constitute the requisite sample size given in col 6 of Table 1. Any fireworks pencils failing to satisfy one or more of these requirements shall be considered as defective.

F-2.2.1 The lot shall be considered to have satisfied these requirements if the number of defectives found in the sample is less than or equal to the corresponding permissible number of defectives given in col 7 of Table 1.

F-2.3 The lot having satisfied the requirements given in F-2.1 and F-2.2 shall be finally tested for the remaining requirements given in 6.4, 6.5 and 6.5. For this purpose, the number of tests to be conducted for each of these requirements is given in col 8 of Table 1. The required number of fireworks pencils for carrying out these tests shall be selected from those boxes already tested according to F-2.2 and found satisfactory.

F-2.3.1 The lot shall be considered to have satisfied these requirements if no failure occurs.

Table 1 Scale of Sampling for Fireworks Pencils
(Clauses F-1.3, F-2.1, F-2.2, F-2.2.1 and F-2.3)

No. of Boxes in the Lot	No. of Packets to be Selected	No. of Boxes to be Selected	No. of Boxes to be Selected for Damp Proofness	For Requirements Given in 6.1, 6.2 and 6.3			No. of Tests for Each of the Requirements Given in 6.4, 6.5 and 6.6
				No. of Boxes to be Selected	No. of Fireworks Pencils Selected	Permissible No. of Defectives	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 500	2	6	2	4	13	1	1
501 to 1 000	3	9	3	6	20	2	2
1 001 to 3 000	5	12	4	8	22	3	3
3 001 to 10 000	5	15	5	10	50	5	4
10 001 and above	10	21	6	15	80	7	5

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